A new species of Plagiostoma from the Kuruma Group and Domerian transgression in the Inner Zone of southwest Japan

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A new species of *Plagiostoma* from the Kuruma Group and Domerian transgression in the Inner Zone of Southwest Japan*

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来馬層群より産したプラジオストマの新種と西南日本内帯におけるドメリアンの海進

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長野・新潟・富山3県の県境地域に分布するジュラ紀前期の来馬層群は，その中・上部にアンモナイトを産する海進堆積物を含むことが知られている。最近，富山市科学文化センターおよび高岡地学研究会の同好者は森群平氏の案内で富山県大平川上流の寺谷入口附近において巡検を行なった。その折大型二枚貝化石を含む砂質頁岩の転石が発見され，富山市科学文化センターに収蔵されることになった。検討の結果，この化石はジュラ紀に繁栄したミノガイ科のプラジオストマ属に属する1新種の右殻であることが判明したので，*Plagiostoma toyamanum*〔トヤマミノガイ〕と名付けて記載する。この種はかなり大型で，殻のふくらみは弱く，比較的短い鋏線と凹んだ前縁を持ち，肥厚して粗い成長線を有する前耳部といくらか屈曲した65本程度の放射肋で特徴づけられる。なお同一の転石には，すでにほぼ同地点の寺谷層から産出が知られている *Canavaria* sp. に同定されるアンモナイトが含まれているので，その時代がドメリアン（プリンスバキアン後期）であることは確実である。

ドメリアンは西南日本内帯で広範囲の海進が起った時期と考えられ，中国地方西部の豊浦層群や樋口層群にも同時期のアンモナイト頁岩が下位の *Cardinia* 砂岩などを覆って発達する。この時期の西南日本内帯の動物群は，*Amaltheus* で代表される北方動物区の要素と，*Canavaria* や *Fontanelliceras* で代表されるテチス区の要素の混在で特徴づけられることがこれまでの研究により知られている。来馬層群の二枚貝類はすべて本邦独自の種と考えられてきたが，長野県北小谷の本層群模式地域から知られる *Radulonectites japonicus* はオホーツク海北方地域から最近記載された種にきわめて近縁で，北方動物区の要素とみなすことができる。オホーツクの種が *Amaltheus* に伴って産出することを考えると，北小谷地域の *Radulonectites* を含む本層群中部の海成層もドメリアン海進の産物であることが間接的に示唆される。

Introduction

Several months ago, Toyama Science Museum and some active members of the Takaoka Earth Science Club (Takaoka Chigaku-kenkyu-kai) had an excursion to the upper stream of the Daira (Sakai) River in the eastern borderland of Toyama Prefecture, collecting some

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fossils from the Lower Jurassic Kuruma Group. Then, a boulder of fossiliferous sandy shale was found near the mouth of Teradani, a tributary of the river. They asked to the Toyama Science Museum to keep it. At the occasion of the 126th Meeting of the Palaeontological Society of Japan held at this museum (October 10-12, 1980), one of us (I. H.) observed the fossils and concluded that a large bivalve attached to the boulder belongs to an undescribed species of *Plagiostoma*.

The Kuruma Group is extensively distributed in the mountaneous frontier region of Nagano, Niigata and Toyama Prefectures. It is mainly composed of brackish-water clastic sediments with abundant neomiodontids (so-called cyrenoids) and plant fossils of Rhaeto-Liassic type, and the occurrence of ammonites and other purely marine fossils is almost restricted to the middle-upper part, namely the upper Pliensbachian Teradani and Toarcian Otakidani Formations (Kobayashi *et al.*, 1957 ; Sato *et al.*, 1963). The Teradani Formation yields *Amaltheus* sp., *Canavaria* sp. ex gr. *C. geyeriana* (Haas) and *Variamussium* (?) sp. at the lower stream of Teradani (Sato, 1955 ; Hayami, 1957b). The present fossiliferous boulder was found near the ammonite locality, and, moreover, contains a fragment of an ammonite which seems to be identical with *Canavaria* sp. ex gr. *C. geyeriana*. Therefore, a Domerian (= upper Pliensbachian) age is strongly suggested also for this boulder.

In the present article a new species of *Plagiostoma* is described on the above mentioned material, and the Domerian transgression in the Inner Zone of Southwest Japan is discussed.

Before going further, we express our sincere thanks to Mr. Gunpei Mori and the members of the Takaoka Earth Science Club for the privilege of describing their collection.

Systematic description

Cox (1943) clearly defined various terms on the morphology, orientation and measurements for the description of British Jurassic species of *Plagiostoma*. His terminology is followed here.

Family Limidae Rafinesque, 1815
Genus *Plagiostoma* J. Sowerby, 1814

Plagiostoma toyamanum Hayami and Akahane, sp. nov.

(Plate 1, Figures 1, 2)

Type. The holotype (Toyama Science Museum, F-13 ; rubber and plaster models in the University Museum, the University of Tokyo, MM9700) is a right internal mould (79.3 mm long, 80.4 mm high, 13.0 mm thick), which is attached to a boulder of sandy shale (probably derived from the Teradani Formation) collected near the mouth of Teradani (Fig. 1), a tributary of the Daira River, Asahi-machi, Shimoniikawa-gun, Toyama Prefecture.

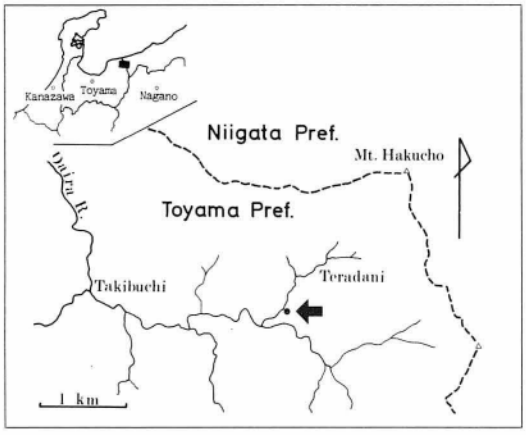

Fig. 1. Index map showing Teradani and the finding point of the fossil.

Diagnosis: Large-medium species of *Plagiostoma,* characterized by broadly trapezoidal and weakly inflated outline, more or less excavated anterior margin, thickened anterior auricle with squarrose growth-lamellae and about 65 radial ribs which are slightly sinuous, irregularly spaced and much wider than their interspaces.

Description: Shell comparatively large, broadly trapezoidal, opisthocline, nearly as long as high, weakly inflated; hinge-line relatively short, occupying about one-third of length; anterior margin broadly concave, forming an angle of about 45 degrees with hinge axis; posterior margin a little concave behind posterior auricle but passing gradually into broadly rounded ventral margin; anterior umbonal ridge not sharp, becoming rather indistinct toward anterior area; lunule moderate in width, slightly excavated, nearly smooth; umbo depressed, nearly orthogyrous; apical angle except for auricles about 110 degrees; anterior auricle remarkably thickened, marked with *Ctenostreon*-like squarrose growth-lamellae; disk ornamented with about 65 simple radial ribs which are not weakened toward middle, slightly sinuous, flat-topped, sometimes interrupted by growth-rings, somewhat irregular in breadth but generally much wider than their interspaces; ligament area obtuse-triangular, exceeding 10 mm in height with a large, prosocline and roundly triangular pit; right valve having a subhorizontally elongated socket below posterior part of ligament area, which probably corresponds with a tooth on counter valve; umbonal cavity depressed and deep.

Remarks: The present species is now represented only by a right internal mould with clearly impressed radial ornamentation. The test is almost entirely eroded away, but the ligament structure and anterior wing of *Plagiostoma*-type are well exhibited, as recognized from its rubber cast.

Plagiostoma flourished world-widely in the Jurassic, and a large number of species have been described from the Lower Jurassic of various regions. Among European species the present species resembles *Lima (Plagiostoma) pontonis* Lycett in Morris and Lycett, 1853, from the Inferior Oolite of England (Cox, 1943) in the relatively large size, weak convexity and number of radial ribs. However, it is distinguishable from that species by the broader shell, distinctly concave anterior margin and somewhat sinuous radial ribs. The *Ctenostreon*-like squarrose growth-lamellae on the thickened anterior auricle may be also a diagnostic character of *P. toyamanum. Lima (Plagiostoma) punctata* (J. Sowerby) sensu Chapuis and Dewalque, 1853, from the Lias of western Europe and *Lima (Plagiostoma) parapunctata*

Kiparisova, 1952, from the Amur region are also similar in the outline, but shell convexity is much stronger in those species. Among hitherto known Japanese species the present species may be related to *Plagiostoma kobayashii* Hayami, 1959, from the Lower Liassic Higashinagano Formation of west Honshu, but the size is much larger and the radial ribs, though comparable in number, are more irregularly disposed and sinuous. *Plagiostoma matsumotoi* Hayami, 1959, also from the Higashinagano Formation differs from the present species in the much smaller size and weaker radial ornamentation.

Notes on the Domerian transgression in the Inner Zone of Southwest Japan

The Domerian (= Upper Pliensbachian) ammonoid fauna of the Kuruma Group in central Honshu has been interpreted as a mixture of Boreal and Tethyan elements as exemplified by the coexistence of *Amaltheus* and *Canavaria* at one and the same locality of Teradani (Sato, 1955, 1960). In the standard section of the middle-upper part of the Kuruma Group along the Daira River and its tributaries, the ammonite-bearing sandy shale of the Teradani Formation transgressively overlies the neomiodontid and plant-bearing sandstone and shale of the Negoya Formation (Kobayashi et al., 1957).

A transgression of this substage is also well recognized in west Honshu. As investigated by Matsumoto and Ono (1947), Arkell (1956), Hayami (1959) and Hirano (1971, 1973a, b), the *Cardinia*- and *Oxytoma*-bearing sandstones of the Higashinagano Formation (lower division of the Toyora Group) is conformably overlain by the *Fontanelliceras*- and *Canavaria*-bearing shale of the Nishinakayama Formation (middle division of the Toyora Group) in the western part of Yamaguchi Prefecture. Furthermore, a specimen of *Amaltheus* sp. cf. *A. stokesi* was recorded to occur from the passage bed between the two formations (Hirano, 1971). The lower part of the Nishinakayama Formation is composed of fissile shale, and the lithology and mode of fossil occurrence are somewhat similar to those of the "Posidonienschiefer" in the Holzmaden area of south Germany. Some stagnant and anaerobic sedimentary environment with scarce benthonic organisms such as calm bottom of an inland sea is suggested for this part.

In the recently discovered Higuchi Group in the western part of Shimane Prefecture, similar lithological change in upward sequence is presumable. Although the stratigraphy and molluscan fauna of this group are not yet fully described, *Fontanelliceras*- and *Canavaria*-bearing shale (Hirano et al., 1978) along the upper stream of Higuchizawa is most certainly assignable to the upper part of this group, and an undescribed species of *Cardinia* occurs abundantly in some coarse-grained sandstones of the lower part (Mikami, personal communication).

From these bio- and litho-stratigraphical evidences, it is now conclusive that an extensive transgression took place in the Domerian time in the Inner Zone of Southwest Japan. Although the thickness of sediments of this substage may be different among these areas, the beginning of this transgression can be regarded as nearly synchronous among the

Kuruma, Toyoura and Higuchi areas.

The type locality of the Kuruma Group is situated at Kuruma in the Kitaotari area, northern borderland of Nagano Prefecture. The middle part of the Kuruma Group in this area yields some marine and brackish-water bivalves as well as abundant plant fossils, but the absence of any effective index fossils and key beds prevents us from its correlation with the standard section in the Daira River area.

When one of us (Hayami, 1961) summarized the general characters of bivalve faunas from the Kuruma Group, all the constituent species were regarded as endemic, because no foreign element had been found. Only a few brackish-water species are common with nearly contemporaneous faunas in other regions of Japan. Subsequently, however, Liassic molluscan faunas in east Siberia were studied by several Russian authors, and available data for biogeographic consideration have been amplified. Among others, *Radulonectites hayamii* Polubotko in Efimova et al., 1968, which is a very characteristic pectinid from the *Amaltheus stokesi* Zone in the Omolon River and Korkodon River areas of the Kolyma Range and also in the coastal area of northwestern Ochotsk Sea, is, if not identical with, closely related to *Radulonectites japonicus* Hayami, 1957a, from the middle part of the Kuruma Group of the type area (several localities along the middle stream of Tsuchizawa in the Kitaotari area). This pectinid is here regarded as another characteristic element of Boreal fauna, and it is, though indirectly, suggested that the pectinid-bearing marine beds in the Kitaotari area are also a product of this Domerian transgression.

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Plate. 1. Fig. 1. *Plagiostoma toyamanum* Hayami and Akahane, sp. nov. Internal mould of right valve. Holotype. ×1. Probably derived from the Upper Pliensbachian Teradani Formation of the Kuruma Group. Attached to a boulder collected near the mouth of Teradani, a tributary of the Daira River, Asahi-machi, Shimoniikawa-gun, Toyama Prefecture. Repository: Toyama Science Museum (F-13).

Fig. 2. Rubber cast from the same specimen. ×1. Repository: The University Museum, the University of Tokyo (UMUT MM9700).

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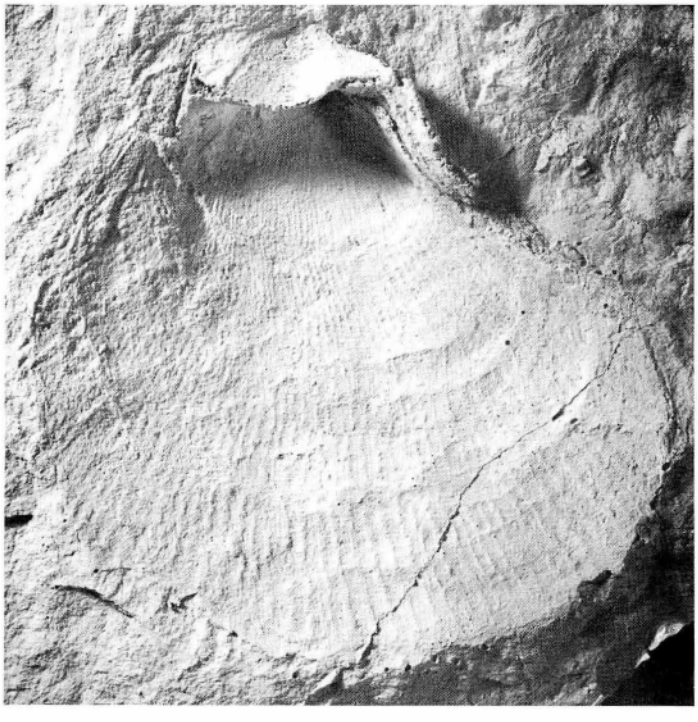

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